

CLAIMS

1. A method for manufacturing engine fuel, comprising:

a pretreatment step for filtering a higher-boiling-point vegetable oil/fat;

5 a first treatment step for introducing ozone, a reducing agent and a polymerization inhibitor into the higher-boiling-point oil/fat, so as to cause the higher-boiling-point oil/fat component and the ozone to react with each other while adjusting the reactivity in the presence of the reducing agent and polymerization inhibitor, to thereby crack the higher-boiling-point oil/fat component;

10 a first filtering step for filtering the higher-boiling-point oil/fat so as to remove therefrom solid components including the reducing agent and polymerization inhibitor having been deteriorated by the cracking reaction;

a second treatment step for newly introducing a fresh reducing agent and a fresh polymerization inhibitor both having higher activities and for simultaneously
15 introducing ozone, into the filtrate, so as to crack the higher-boiling-point oil/fat component while subsequently stirring the higher-boiling-point oil/fat component; and

a step for repeating said treatment steps for cracking the higher-boiling-point oil/fat component in a manner to conduct such a treatment step totally two or more times while interposing said filtering step between said treatment steps, to thereby
20 reform the higher-boiling-point oil/fat into a lower-boiling-point oil while delivering an antifreezing agent into the lower-boiling-point oil.

2. A method for manufacturing engine fuel of claim 1,

wherein said stirring treatments for breaking the constitution of the starting
25 material to thereby cause a cracking phenomenon substantially require a stirring rotational speed of at least 10,000 rpm.

3. A method for manufacturing engine fuel of any one of claims 1 and 2,

wherein the vegetable oil is a filtrate obtained by compressing waste
30 vegetables.

4. A method for manufacturing engine fuel of any one of claims 1 through 3,

wherein said step for filtering out the solid components comprises a step for introducing and using a filtering medium including at least one of activated clay, diatomaceous earth, zeolite, activated carbon, and bone ash, at a rate of 20 kg to 25 kg to 1 kiloliter of the reaction liquid.

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5. A method for manufacturing engine fuel of any one of claims 1 through 4, wherein said treatment step comprises a step for introducing ozone in a form of ozone-containing air into the cracking reaction, at a concentration of 500 ppm to 30,000 ppm.

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6. A method for manufacturing engine fuel of any one of claims 1 through 5, wherein the reducing agent includes at least one of ferric oxide compound and copper compound, and is used at a rate of 0.15 g for 1 kiloliter of reaction liquid.

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7. A method for manufacturing engine fuel of any one of claims 1 through 6, wherein the polymerization inhibitor includes a phosphorus compound and is used at a rate of 0.2 g to 0.25 g for 1 kiloliter of reaction liquid.

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8. A method for manufacturing engine fuel of any one of claims 1 through 7, wherein the antifreezing agent includes castor oil and is introduced into the lower-boiling-point oil at a concentration of 0.05 wt.% to 0.1 wt.%.

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9. An apparatus for manufacturing engine fuel by cracking a higher-boiling-point vegetable oil/fat to thereby reform the same into a lower-boiling-point oil, comprising:

a reaction drum into which the higher-boiling-point oil/fat is introduced; and stirring means within said reaction drum;

wherein said stirring means comprises: a rotating propeller plate for revolving a reaction liquid; and a baffle provided at an inner periphery of said reaction drum;

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wherein said baffle comprises a vertical plate having a widthwise portion protruded from an inner peripheral wall surface of said reaction drum toward the

center of said reaction drum, and said baffle is formed with saw-toothed cutouts at the protruded end; and

wherein said reaction drum is provided with a delivering port for delivering a reducing agent and a polymerization inhibitor into said reaction drum.

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10. An apparatus for manufacturing engine fuel of claim 9,
wherein said rotating propeller plate comprises a propeller having a peripheral portion formed with saw-toothed cutouts.

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11. An apparatus for manufacturing engine fuel by cracking a higher-boiling-point vegetable oil/fat to thereby reform the same into a lower-boiling-point oil, comprising:

a reaction drum into which the higher-boiling-point oil/fat is introduced;
stirring means within said reaction drum;

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an ozone gas introducing pipe having a spout for introducing ozone for causing a cracking reaction; and

suspending means provided near said spout of said ozone gas introducing pipe, for suspending the ozone gas;

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wherein said suspending means is formed of a horizontal rotary-rod wound with wires in a resilient manner; and

wherein said reaction drum is provided with a delivering port for delivering a reducing agent and a polymerization inhibitor into said reaction drum.

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12. A plant for manufacturing engine fuel, comprising:

a starting-material tank for storing oil/fat therein;

a filtering device for filtering out solid components of the oil/fat in said starting-material tank;

a first reaction vessel for conducting first cracking by reacting ozone with the oil/fat filtered by said filtering device;

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an oil/water separation device for separating that water content involved in the cracking reaction, from the oil/fat;

a filtering medium charging vessel for delivering a filtering medium into the oil/fat phase from which the water phase component has been excluded by said oil/water separation device;

5 a first filtering device for conducting first filtering of the oil/fat into which the filtering medium has been delivered;

a second reaction vessel for reacting ozone with the filtered oil/fat, to thereby conduct second cracking;

a second filtering device for conducting second filtering of the oil/fat subjected to the second cracking;

10 an adding device for adding an additive into the oil/fat subjected to the second filtering; and

an impurity adsorbing vessel and a filtering vessel for cooperatively purifying the water phase component from which the oil/fat phase has been excluded by said oil/water separation device;

15 wherein each of said first reaction vessel and said second reaction vessel is provided with a delivering port for delivering a reducing agent and a polymerization inhibitor into said reaction vessel.